



TENNESSEE DEPARTMENT OF

EDUCATION
FIRST TO THE TOP

Applied Environmental Science

Primary Career Cluster:	Agriculture, Food and Natural Resources
Consultant:	Steven Gass, (615) 532-2847, Steven.Gass@tn.gov
Course Code(s):	6114
Prerequisite(s):	<i>Agriscience</i> (5957)
Credit:	1
Grade Level:	10
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Agriculture courses. In addition, this course satisfies one credit of laboratory science required for graduation.
Programs of Study and Sequence:	This is the second course in the <i>Environmental and Natural Resources Systems</i> program of study.
Aligned Student Organization(s):	FFA: http://www.tnffa.org Allie Ellis, (615) 253-5207, Allie.Ellis@tn.gov
Coordinating Work-Based Learning:	All Agriculture students are encouraged to participate in a Supervised Agricultural Experience (SAE) program. In addition, Teachers are encouraged to use embedded WBL activities. For information, visit http://tn.gov/education/cte/work_based_learning.shtml .
Available Student Industry Certifications:	None
Dual Credit or Dual Enrollment Opportunities:	There are no statewide dual credit/dual enrollment opportunities for this course. If interested in establishing a local opportunity, reach out to a local postsecondary institution.
Teacher Endorsement(s):	(048 and 015), (048 and 016), (048 and 017), (048 and 081), (048 and 211), (048 and 212), (048 and 213), (048 and 214), (048 and 414), (048 and 415), (048 and 416), (048 and 417), (048 and 418), (048 and 449), (150 and 015), (150 and 016), (150 and 017), (150 and 081), (150 and 151), (150 and 211), (150 and 212), (150 and 213), (150 and 214), (150 and 414), (150 and 415), (150 and 416), (150 and 417), (150 and 418), (150 and 449), (448 and 015), (448 and 016), (448 and 017), (448 and 081), (448 and 211), (448 and 212), (448 and 213), (448 and 214), (448 and 414), (448 and 415), (448 and 416), (448 and 417), (448 and 418), (448 and 449)
Required Teacher Certifications/Training:	None
Teacher Resources:	http://www.tn.gov/education/cte/AgricultureFoodNaturalResources.shtml

Course Description

Applied Environmental Science focuses on the knowledge, information, and skills related to the fundamental science and management of ecosystems as well as careers, leadership, and history of the industry. This course covers principles of environmental impacts, energy consumption, and ecosystem management. Upon completion of this course, proficient students will be prepared for advanced coursework in the *Environmental and Natural Resources* program of study. Standards in this course are aligned with Tennessee State Standards for English Language Arts & Literacy in Technical Subjects, Tennessee Biology I, Tennessee Biology II, Tennessee Ecology, and Tennessee Environmental Science, as well as National Agriculture, Food and Natural Resources Career Cluster Content Standards.*

Program of Study Application

This is the second course in the *Environmental and Natural Resources* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Agriculture, Food, & Natural Resource website at <http://www.tn.gov/education/cte/AgricultureFoodNaturalResources.shtml>.

Course Standards

Occupational Awareness & Safety

- 1) Use local news media, organizational websites, and real-time labor market information to investigate occupations in environmental science. Compare and contrast the knowledge, skills, and abilities necessary for employment, as well as the typical level of education required. (TN Reading 2, 9; TN Writing 4, 7, 9)
- 2) Review common laboratory safety procedures for tool and equipment operation in the environmental and natural resources laboratories, including but not limited to accident prevention and control procedures. Demonstrate the ability to follow safety and operational procedures in a lab setting and complete a safety test with 100 percent accuracy. (TN Reading 3)

Studying the Environment

- 3) Define the scope and impact of contemporary environmental science. Describe the interdisciplinary nature of this field and provide examples of how other sciences such as biology, chemistry, earth science, and physics relate to environmental science. Research scholarly, peer-reviewed academic journals focused on the biophysical environment and identify leading academic and professional organizations publishing results of environmental research. (TN Reading 2, 5; TN Writing 7)
- 4) Define the term *biome* and indicate on a map the major biomes of the world. Develop an annotated graphic that can be used to compare and contrast the climates, seasons, soil characteristics, water availability, and other defining features of each biome. Differentiate between biomes within the following categories: aquatic, grasslands, forest, desert, and tundra. (TN Reading 4, 7; TN Writing 4, 9; TN Biology I 2; TN Biology II 2; TN Ecology 5; TN Environmental Science 2)

- 5) Apply basic business and entrepreneurship principles to plan, set up, operate, or expand an environmental science related Supervised Agricultural Experience (SAE) program. Compare the components of SMART goals in relation to evaluating the success of the program. Accurately maintain the prescribed activity recordkeeping system and apply proper financial recordkeeping skills as they relate to the SAE program. (TN Reading 2; TN Writing 4, 9)

Human Impact on the Environment

- 6) Using instructional materials and news media, research the evolving impact of humans on the environment, from primitive societies to contemporary civilizations. Synthesize analysis in an explanatory essay or presentation that highlights specific milestones and events, citing textual evidence of both positive and negative impacts. (TN Reading 1, 2; TN Writing 2, 4, 7, 9)
- 7) Synthesize census data and other resources to compare U.S. population statistics to those of other countries around the world. Specifically examine growth rate, age structure, life expectancy, and total population, among other key parameters. Analyze the factors that impact population growth, and assess the impact of population growth in the U.S. and the world on the following: availability of natural resources, land usage, waste production and pollution, and global economic health. (TN Reading 2, 4, 5, 9; TN Environmental Science 3)

Ecosystems

- 8) Research the components of an ecosystem. Synthesize findings by developing a glossary of terms essential to the study of ecosystems, defining at least the following: habitat, niche, producers, consumers, and vertical stratification. (TN Reading 4, 5; TN Writing 4, 7, 9; TN Biology I 3; TN Biology II 3; TN Ecology 4; TN Environmental Science 4, 5)
- 9) Compare and contrast grassland, forest, aquatic, and wetland ecosystems including types and species, and explain how biogeochemical cycles and food webs facilitate the flow of energy and the recycling of matter, supplying examples of species that fulfill key roles in each ecosystem. Illustrate similarities in the structure and life processes of ecosystems despite key differences across types of ecosystems. (TN Reading 5, 9; TN Writing 4, 7, 9; TN Biology I 3; TN Biology II 3; TN Ecology 4; TN Environmental Science 4, 5)
- 10) Analyze how the abiotic and biotic components of the ecosphere interact with and impact one another. Apply knowledge of these interactions to determine the suitability of an area for different types of development (such as commercial, industrial, and primary residential). Develop a claim about a development issue that impacts a selected ecosphere, supporting the claim with evidence and sound reasoning from research. (TN Reading 2, 5; TN Writing 1, 9; TN Biology I 3; TN Biology II 3; TN Ecology 4; TN Environmental Science 2)
- 11) Create a graphic and accompanying text illustrating primary and secondary succession in a selected biome. Include a discussion of the pioneer species for that biome. Compare immature and mature ecosystems and discuss indicators that can be observed to determine maturity and quality of the ecosystem. (TN Reading 7; TN Writing 4, 9; TN Ecology 5; TN Environmental Science 2)

- 12) Citing case studies from news media, academic journals or instructional materials, discuss the importance of biodiversity in an ecosystem. Assess how various land uses might impact biodiversity in a given area. Summarize findings in an informational essay on one of the following topics:
- a. Impact of the intentional or unintentional introduction of non-native species to an ecosystem
 - b. Threatened and endangered species
 - c. Agricultural Best Management Practices that promote biodiversity
- (TN Reading 1, 2; TN Writing 2, 4, 7, 8, 9; TN Biology I 2; TN Biology II 2; TN Ecology 5; TN Environmental Science 2)

Energy Consumption

- 13) Identify energy resources used in the United States and abroad, distinguishing between renewable and nonrenewable resources. Research the global distribution of energy resources; determine major resource-rich regions and how they intersect with geopolitical boundaries. (TN Environmental Science 4, 5, 7)
- 14) Synthesize public data from government agencies and news organizations to compare energy consumption in the United States to the energy consumption of other countries. Create a series of graphs and charts to inform an average citizen about energy use trends and statistics, including the percentage of each resource that comes from domestic and foreign sources. Investigate claims made about the political and economic implications of using foreign energy resources, analyzing author's purpose and assess the extent to which the reasoning and evidence provided support the author's claim. (TN Reading 2, 6, 7, 8; TN Writing 4, 7, 8; TN Environmental Science 5, 7)
- 15) Investigate available print and digital tools for conducting an audit of personal energy use. Compile and analyze self-collected data on total energy use, including transportation, water, and electricity consumption, among others. Create and implement a plan to reduce personal energy use. Compare the usage data after one month of implementing the plan, and discuss key takeaways learned from the project. (TN Writing 4, 7; TN Environmental Science 5, 7)

Managing Ecosystems

- 16) Research standard methods for monitoring a variety of environmental conditions, including but not limited to air, water, and soil, as well as the biological components of an ecosystem. For each domain, create a fact sheet outlining common tests and procedures and the kinds of information learned from the analysis of test results. Demonstrate at least one procedure for learning about each domain. (TN Reading 2, 3; TN Writing 2, 4, 7; TN Biology I 2; TN Biology II 2; TN Ecology 5; TN Environmental Science 2)
- 17) Research sustainability as it applies to ecosystems and natural resources. Explain the importance of ensuring sustainability when developing a management plan for a specific resource or ecosystem. Outline the components of a management plan, and summarize best practices for the management of forest, wetland, aquatic, and grassland ecosystems. (TN Reading 2, 5; TN Writing 2, 4, 7, 9; TN Environmental Science 2, 4)

- 18) Describe the evolution of integrated pest management (IPM) strategies through history. Create a brochure that explains the purpose and principles of IPM. Present specific IPM strategies for controlling common home and landscape pests. Create additional informational sheets for large-scale pest control in a variety of natural and human engineered environments. (TN Reading 2; TN Writing 4; TN Environmental Science 4)

Legal and Civic Responsibility

- 19) Citing specific legislation and international conventions and treaties, create a timeline depicting the historical development of environmental regulation at the state, national and global levels. For each regulation represented on the timeline, summarize the intended goals and ultimate impact of that regulation. Include legislation related to air, water, toxic substances, wastes, energy resources, and mandated environmental impact studies. (TN Reading 1, 2, 7; TN Writing 4, 7, 9; TN Environmental Science 7)
- 20) Describe the role of federal, state, and local governments in enforcing environmental legislation. Differentiate between key agencies at each level and justify the need for general regulations of environmental hazards. (TN Reading 2)
- 21) Choose a current environmental issue and conduct research on environmental and ethical implications for potential solutions. Craft an argumentative essay, developing a claim supporting a specific solution and develop both claim(s) and counterclaim(s) with logical evidence and reasoning. (TN Reading 1, 8; TN Writing 1, 7, 8, 9; TN Environmental Science 7)

Standards Alignment Notes

*References to other standards include:

- TN Reading: [Tennessee State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects](#); Reading Standards for Literacy in Science and Technical Subjects 6-12; Grades 9-10 Students (page 62).
 - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to demonstrate fluency in Standard 10 at the conclusion of the course.
- TN Writing: [Tennessee State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects](#); Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12; Grades 9-10 Students (pages 64-66).
 - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to demonstrate fluency in Standards 3, 5, 6, and 10 at the conclusion of the course.
- SAE: [Supervised Agricultural Experience](#): All Agriculture students are encouraged to participate in a Supervised Agricultural Experience program to practice and demonstrate the knowledge and skills learned in their agriculture courses.
- TN Biology I: Tennessee Science: [Biology I](#) standards 2 and 3 may provide additional insight and activities for educators.
- TN Biology II: Tennessee Science: [Biology II](#) standards 2 and 3 may provide additional insight and activities for educators.

- TN Ecology: Tennessee Science: [Ecology](#) standards 4 and 5 may provide additional insight and activities for educators.
- TN Environmental Science: Tennessee Science: [Environmental Science](#) standards 2, 3, 4, 5, and 7 may provide additional insight and activities for educators.
- AFNR: [National Agriculture, Food and Natural Resources \(AFNR\) Career Cluster Content Standards](#): Students who are engaging in activities outlined above should be able to demonstrate fluency in Standards ESS.01, .02, .03, .04, .05, .06; NRS.01, .02, .04, and .05 at the conclusion of the course.
- P21: Partnership for 21st Century Skills [Framework for 21st Century Learning](#)
 - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.